

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1 – 14 (Cancelled).

Claim 15 (Cancelled)

Claim 16 (Previously Presented): The method of claim 30, wherein said mixture further comprises an additive gas, wherein said additive gas comprises at least one member selected from the group consisting of:

- a) helium;
- b) hydrogen; and
- c) mixtures thereof.

Claim 17 (Previously Presented): The method of claim 30, wherein said mixture further comprises a supplementary gas.

Claim 18 (Cancelled)

Claim 19 (Previously Presented): The method of claim 16, further comprising adjusting the composition of said mixture to optimize said mixture's convective heat transfer coefficient, as compared to the individual convective heat transfer coefficients of each component of said mixture.

Claim 20 (Previously Presented): The method of claim 16, further comprising:

- a) cooling said parts in a vessel, wherein said vessel comprises a gas stirring system; and

- b) adjusting the composition of said mixture to obtain an average density of said mixture which is capable of being stirred by said stirring system, without having to make significant changes to said vessel.

Claim 21 (Previously Presented): The method of claim 16, further comprising adjusting the composition of said mixture so that endothermic chemical reactions can occur between said absorbing gas and at least one other component of said mixture.

Claim 22 (Previously Presented): The method of claim 16, wherein said absorbing gas comprises CO₂.

Claim 23 (Cancelled)

Claim 24 (Previously Presented): The method of claim 30, wherein the content of said absorbing gas in said mixture is between about 5% to about 100% of the total mixture volume.

Claim 25 (Previously Presented): The method of claim 24, wherein said content is between about 20% to about 80%.

Claim 26 (Currently Amended): The method of claim 30, wherein said gas mixture comprises a binary CO₂/He mixture, wherein the CO₂ content of said mixture is between about 20% 30% to about 80% of the total mixture volume.

Claim 27 (Currently Amended): The method of claim 30, wherein said gas mixture comprises a binary CO₂/H₂ mixture, wherein the CO₂ content of said mixture is between about 20% 30% to about 80% of the total mixture volume.

Claim 28 (Previously Presented): The method of claim 30, further comprising recycling said mixture wherein said recycling comprises:

- a) recompressing said mixture prior to a subsequent use; and
- b) processing said mixture to recover at least one component of said mixture, wherein said processing comprises at least one process selected from the group consisting of:
 - 1) separating; and
 - 2) purifying.

Claim 29 (Cancelled): A method which may be used for rapidly cooling metal parts with a pressurized cooling gas in an apparatus, said method comprising:

- a) cooling said parts with said cooling gas, wherein said cooling gas comprises:
 - 1) about 20% to about 80%, of the total cooling gas volume, of an infrared absorbing gas; and
 - 2) about 80% to about 20%, of the total cooling gas volume, of a second gas, wherein said second gas comprises at least one member selected from the group consisting of:
 - i) hydrogen;
 - ii) helium; and
 - iii) mixtures thereof; and
- b) adjusting the composition of said cooling gas so that significant later changes to said apparatus are unnecessary.

Claim 30 (Currently Amended): A method for rapidly cooling metal parts using a pressurized cooling gas mixture, wherein:

the cooling gas mixture comprises one or a plurality of infrared radiation absorbing gases selected from the group comprising saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof;

the composition of said mixture is adjusted to obtain an average mixture density that is approximately the same as that of nitrogen; and

the mixture has convective heat transfer properties superior to those of nitrogen in similar cooling conditions.

Claim 31 (Currently Amended): A method for rapidly cooling metal parts using a pressurized cooling gas mixture, wherein:

the cooling gas mixture comprises a content of from about 5% to about 80% by volume of one or a plurality of infrared radiation absorbing gases selected from the group comprising saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof in order to improve the heat transfer to the part by combining radiative and convective heat transfer phenomena and to improve the convective heat transfer coefficient in comparison with conventional conditions of cooling under nitrogen; and

the cooling gas further comprising an additive gas having a good convective heat transfer capability and selected from helium, hydrogen and mixtures thereof; the composition of said cooling gas mixture being adjusted to obtain an average mixture density that is approximately the same as that of nitrogen.